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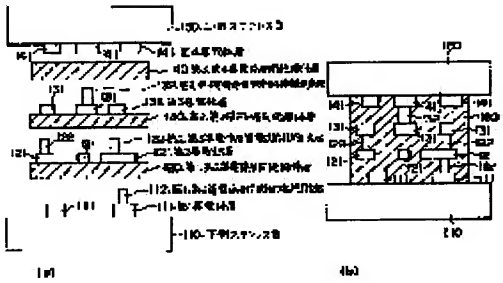
(54) METHOD FOR MANUFACTURING PRINTED CIRCUIT BOARD

(57)Abstract:
PURPOSE: To achieve contact and contact bonding to an opposing conductor circuit layer by allowing a protrusion to break through an insulator resin layer with the pressure obtained by pressing a lamination body using a press tool plate.
CONSTITUTION: A protrusion 112 for connecting first and second conductor layers, a protrusion 122 for connecting second and third conductor layers, and a protrusion 132 for connecting third and fourth conductor layers break through an insulator 120 between the first and second conductor layers, an insulator 130 between the second and third conductor layers, and an insulator 140 between the third and fourth conductor layers, thus achieving contact to a second conductor layer 121, a third conductor layer 131, and a fourth conductor layer 141, respectively, for improved contact bonding. The insulator layer between conductor layers is a sheet made of insulation resin and the protrusion for connecting conductor layers is formed by electrolytic plating.



CLAIMS

[Claim(s)]
[Claim 1]An insulation layer which has a conductor circuit layer, and said insulation layer which does not have a conductor circuit layer on both sides or one side predetermined number pile ********, Simultaneously in [pressurize and fabricate from a both-ends side using a press jig board which has said conductor circuit layer, and] a manufacturing method of a predetermined printed circuit board which electrically connects said conductor circuit layer of two upper and lower sides at least, and forms a multilayer printed board, Said each of insulation layers is formed by a sheet shaped insulator resin layer which does not contain glass fiber, A projection which consists of a conductor for electrical links between said conductor circuit layers is provided on a given place of said conductor circuit layer, A manufacturing method of a printed circuit board which said projection breaks through said insulator resin layer, and carries out that you make it contacted and stuck by pressure to said conductor circuit layer which counters with the feature with a pressure by pressing said layered product using said press jig board.
[Claim 2]A manufacturing method of the printed circuit board according to claim 1 heating to melting temperature of said insulator resin layer, and making thrust **** of said projection easy in addition to said pressure in a means by which said projection breaks through said insulator resin layer.
[Claim 3]Instead of being a means by which said projection breaks through said insulator resin layer, a hole of a size along which said projection passes beforehand in a position which said projection breaks through is made, A manufacturing method of the printed circuit board according to claim 1, wherein said projection makes said conductor circuit layer which counters through said hole contacted and stuck by pressure at the time of a press.
[Claim 4]A solder layer which has melting temperature higher than resin curing temperature of said insulator resin layer in a tip part of said projection is provided, Break through said insulator resin layer by said projection by said heat and a pressure, and said solder layer is made to weld by pressure to said conductor circuit layer, A manufacturing method of the printed circuit board according to claim 2 cooling and solidifying said solder layer after going up temperature to melting temperature of said solder this state after stiffening said insulator resin layer, carrying out melting of said solder layer and connecting said projection to said conductor circuit layer.
[Claim 5]A field on which it slides mutually said terminal area contacting [provide said projection provided on said conductor circuit layer which constitutes a terminal area in homotopic of an up-and-down insulator resin layer so that the tip part may counter and] a tip part of said projection mutually at the time of a press, A manufacturing method of the printed circuit board according to claim 2 having geared mutually, having caught each other and having established a field which contacts.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]Especially this invention relates to the manufacturing method of the printed circuit board currently called the multilayer printed board which has many conductor wiring layers in the thickness direction of one substrate about the manufacturing method of a printed circuit board.
[0002]
[Description of the Prior Art]About this kind of printed circuit board, it is explained by Chapter 8 of literature; printed circuit board art, its guarantee-of-quality:applied-technology publication **, information technology center sale, and (August 27, Showa 55 issue) in full detail, for example.
[0003]The copper clad laminate which stuck copper foil on one side or both sides of a sheet which were impregnated with insulating resin at the sheet-shaped board which wove and raised glass fiber to blanket-like in manufacture of a printed circuit board conventionally, The copper foil prepreg etc. which stuck copper foil were used for the sheet shaped insulating material which impregnated with insulating resin the sheet-shaped board which wove and raised glass fiber to blanket-like, and the method of forming a required circuit was adopted by the art of etching these copper foil portions.
[0004]In manufacture of the above-mentioned multilayer substrate which has many copper layers out of the above monolayer boards, it needs to be electric circuit connected between copper circuitry layers. For connection between such layers, the through hole penetrated to a thickness direction is formed, and the wall is coated with methods, such as plating, with a conductive film, and it has structure electrically connected to the required layer of connection. For this reason, in order to establish a through hole in a necessary place, the hole needed to be made in the substrate with the drill etc. And the method of accumulating the material which circuit formation completed with these techniques, pressing with heat and a pressure, and manufacturing a multilayer substrate was in use.
[0005]
[Problem(s) to be Solved by the Invention]In the manufacturing method of the above conventional printed circuit boards, like the request in state-of-the-art art, the size of the substrate miniaturized and slimmed down, the thickness between layers also became thin, and some problems which are itemized next had arisen in the intermediary **** case whose bore diameter of a through hole is still also very smaller.
(1) The glass fiber which constitutes copper clad laminate and prepreg becomes an obstacle of drilling in puncturing of a through hole.
(2) Since glass fiber damages the edge of a drill, contract the life of the edge of a drill remarkably, and when especially a bore diameter is small, costs, such as edge cost of a drill, increase by breakage of a drill etc.
(3) In methods, such as a drill and laser processing, a processible bore diameter has a limit.
(4) By plating in a byway through hole, and its head end process, if the diameter of a through hole becomes small, in order that neither plating liquid nor a treating solution may enter into a hole, plating will not be formed, but it will become defective continuity.

And when it became difficult, the probability which it is poor and is generated also became high and manufacture of the printed circuit board progressed further by these problems, there were problems, like manufacture becomes difficult in the above-mentioned manufacturing method.
[0006]
[Means for Solving the Problem]A manufacturing method of a printed circuit board concerning this invention, An insulation layer which has a conductor circuit layer, and an insulation layer which does not have a conductor circuit layer on both sides or one side predetermined number pile ********, Simultaneously in [pressurize and fabricate from a both-ends side using a press jig board which has a conductor circuit layer, and] a manufacturing method of a predetermined printed circuit board which electrically connects a conductor circuit layer of two upper and lower sides at least, and forms a multilayer printed board, Each insulation layer is formed by a sheet shaped insulator resin layer which does not contain glass fiber, A projection which consists of a conductor for electrical links between conductor circuit layers is provided on a given place of a conductor circuit layer, and a projection breaks through an insulator resin layer and makes a conductor circuit layer which counters contact and stick it by pressure with a pressure by pressing a layered product using a press jig board.
[0007]And the aforementioned insulator resin layer is added to a pressure in a means which a projection breaks through, It may be a manufacturing method which heats to melting temperature of an insulator resin layer, and makes thrust **** of a projection easy, A hole of a size along which a projection passes beforehand is made in a position which a projection breaks through, and it may be made to make a conductor circuit layer which a projection counters through a hole at the time of a press contacted and stuck by pressure apart from this instead of being a means by which a projection breaks through an insulator resin layer. A solder layer which has melting temperature higher than resin curing temperature of an insulator resin layer in a tip part of a projection is provided, After break through an insulator resin layer by projection by heat and a pressure, having made a solder layer weld by pressure to a conductor circuit layer, going up temperature to melting temperature of solder this state, carrying out melting of the solder layer, after stiffening an insulator resin layer, and connecting a projection to a conductor circuit layer, a manufacturing method which cools and solidifies a solder layer may be used. A field on which it slides mutually a terminal area contacting [provide a projection formed on a conductor circuit layer which constitutes a terminal area in homotopic of an up-and-down insulator resin layer so that the tip part may counter and] a tip part of a projection mutually at the time of a press, It may gear mutually and a thing of height structure which it caught for each other and has established a field which contacts may be used.
[0008]
[Function]In this invention, the insulation layer which has a conductor circuit layer, and the insulation layer which does not have a conductor circuit layer on both sides or one side predetermined number pile ********, Simultaneously in [pressurize and fabricate and] the manufacturing method of the predetermined printed circuit board to which the conductor circuit layer of two upper and lower sides is electrically connected at least, Each insulation layer is formed by the sheet shaped insulator resin layer which does not contain glass fiber, the projection (regulus) which consists of a conductor for the electrical links between conductor circuit layers is provided on the given place of a conductor circuit layer, and a layered product is pressed using a press jig board. therefore, compared with having used the sheet shaped insulator resin material (prepreg) containing the conventional textiles, pressing pressure twists to the projection of an insulator resin layer -- it breaking through, and it being able to ** now and using this, Since the conductor circuit layer which counters is made to contact and stick a height by pressure, a terminal area can be thinly formed from formation of the terminal area by the conventional through hole in a byway (small area).
[0009]
[Example]
(The 1st example) Drawing 1 is a substrate constitution explanatory view showing the 1st example of this invention, a left-hand side figure (a) shows the state before press forming, and the right-hand side figure (b) shows the state after press forming. 110 is a tabular bottom

stainless steel stand for forming the 1st conductor layer 111 that constitutes the circuit pattern, and the surface is made from the existing metal of the conductivity of the stainless steel (henceforth stainless steel) etc. which performed mirror finish so that resin and a copper material may exfoliate easily in a final process. This bottom stainless steel stand 110 carries out not only the stand for forming the 1st conductor layer 111 but the duty of the press board of the bottom press jig in the case of heat pressing, thickness is required for it at least 1 mm, and it is required to be smooth in the surface without curvature. And although the method by electrolysis plating with which the formation used plating resist although the 1st conductor layer 111 used as a circuit pattern was formed in the smooth side of the bottom stainless steel stand 110 may be used, the method by printing by the screen version using a paste etc., etc. may be used, for example.

[0010]On the given place of the 1st formed conductor layer 111, the 1st and 2nd conductor layer indirect continued use projection 112 is formed. After forming the 1st conductor layer 111, it may carry out, but formation of the 1st and 2nd conductor layer indirect continued use projection 112 may be simultaneously performed at the time of formation of the 1st conductor layer 111. Even if the formation method of this 1st and 2nd conductor layer indirect continued use projection 112 is the same as that of the 1st conductor layer 111 and it forms it by the method by electrolysis plating using plating resist, the method by printing by screen plate making or a dispenser may be sufficient as it using conductive paste etc. The height of the 1st and 2nd conductor layer indirect continued use projection 112 is the thickness part necessity for the insulating layer provided in the design specification of the substrate which it is going to manufacture.

[0011]The insulation layer 120 between the 1st and 2nd conductor layer is a sheet which consists of insulating resin, and is a member for substrates used in order to plan electric insulation between the 1st conductor layer 111 and the 2nd conductor layer 121. The thickness is the thickness part necessity for the insulating layer provided in the design specification of the substrate which it is going to manufacture. The 2nd conductor layer 121 and the 2nd and 3rd conductor layer indirect continued use projection 122 are formed by the same method as the method of having formed the 1st and 2nd conductor layer indirect continued use projection 112 on the given place of the insulation layer 120 between the 1st and 2nd conductor layer. The height of the 2nd and 3rd conductor layer indirect continued use projection 122 is the thickness part necessity for the insulating layer provided in the design specification of the substrate which it is going to manufacture.

[0012]The insulation layer 130 between the 2nd and 3rd conductor layer is a sheet which consists of insulating resin, and is a member for substrates used in order to plan electric insulation between the 2nd conductor layer 121 and the 3rd conductor layer 131. The thickness is the thickness part necessity for the insulating layer provided in the design specification of the substrate which it is going to manufacture. The 3rd conductor layer 131 and the 3rd and 4th conductor layer indirect continued use projection 132 are formed by the same method as the method of having formed the 1st and 2nd conductor layer indirect continued use projection 112 on the given place of the insulation layer 130 between the 2nd and 3rd conductor layer. The height of the 3rd and 4th conductor layer indirect continued use projection 132 is the thickness part necessity for the insulating layer provided in the design specification of the substrate which it is going to manufacture.

[0013]The insulation layer 140 between the 3rd and 4th conductor layer is a sheet which consists of insulating resin, and is a member for substrates used in order to plan electric insulation between the 3rd conductor layer 131 and the 4th conductor layer 141. The thickness is the thickness part necessity for the insulating layer provided in the design specification of the substrate which it is going to manufacture. The upper part stainless steel stand 150 is a stand for forming the 4th conductor layer 141 of a circuit pattern, and it is desirable that it is the metal which has in the surface the conductivity of the stainless plate etc. which performed mirror finish so that resin and copper may exfoliate easily at the last process. It is for achieving not only the stand for forming the 4th conductor layer 141 but the duty of the press board in the case of heat pressing, and it is required for thickness at least 1 mm or more, and the upper part

stainless steel stand 150 made from this stainless steel does not have curvature, and a thing smooth in the surface is required for it. Therefore, this upper part stainless steel stand 150 is a thing of the same function as the bottom stainless steel stand 110. And although the method by electrolysis plating with which the formation used plating resist although the 4th conductor layer 141 used as a circuit pattern was formed in the smooth side of the upper part stainless steel stand 150 may be used, the method by printing by the screen version using a paste etc., etc. may be used, for example. Although drawing 1 shows the state after 4th conductor layer 141 formation, the composition of a board layer and explanation of a manufacturing method carry out top-and-bottom reversal for convenience, and it is illustrating.

[0014]After accumulating the member to the part numbers 110-150 shown in drawing 1 prepared as mentioned above with sufficient accuracy of position, it presses with heat pressing and the multilayer substrate of one sheet is formed. Although the temperature impressed at the time of a press changes with kinds of insulation material used for the insulation layer 120 between the 1st and 2nd conductor layer, the insulation layer 130 between the 2nd and 3rd conductor layer, and the insulation layer 140 between the 3rd and 4th conductor layer, its glass transition temperature of about +20-30 ** of the resin generally used is the optimal. For example, in the case of an epoxy resin, it is about 170-180 ** generally. The time for the insulation layer 120 between the 1st and 2nd conductor layer, the insulation layer 130 between the 2nd and 3rd conductor layer, and the insulation layer 140 between the 3rd and 4th conductor layer fusing, and flowing into the gap of a conductor circuit pattern without a crevice is required for the time of a press, and it is necessity about 100 minutes in general. And a 25kg[/cm] ^{2} grade is required for the welding pressure of a press.

[0015]By the above pressing operation, the 1st and 2nd conductor layer indirect continued use projection 112, the 2nd and 3rd conductor layer indirect continued use projection 122, and the 3rd and 4th conductor layer indirect continued use projection 132, As the insulation layer 120 between the 1st and 2nd conductor layer, the insulation layer 130 between the 2nd and 3rd conductor layer, and the insulation layer 140 between the 3rd and 4th conductor layer are broken through, respectively and it is shown in (b) of drawing 1, It comes to be firmly stuck to the 2nd conductor layer 121, the 3rd conductor layer 131, and the 4th conductor layer 141 by pressure, respectively. And it becomes possible to take respectively sufficient electrical link. In this case, in order to improve the reliability of connection more, as shown in drawing 4, it is good in the tip part of the projection 402 for terminal areas on the conductor circuit pattern 401 as for a method of a wrap with the precious metals, such as the gold 403 or platinum (403). When each projection breaks through an insulation layer, it is possible to break through each insulating-layer resin very smoothly with the heat supplied from heat pressing, since the resin of an insulating layer itself is softened. Since insulating-layer resin itself is fusing even after thrust **** is completed, since the circumference of a projection is embedded with resin without an opening, it becomes what also has the good quality as a multilayer substrate.

[0016]As shown in drawing 5 as the other methods, solder should be applied to the tip part of the projection 502 for terminal areas formed on the conductor circuit pattern 501 by the suitable method, the soldering arrival portion 503 should be formed, and each class may be pressed. As a coating method of the solder in this case, two methods shown in the following (b) and (**) are preferred.

(b) Solder immerses only the tip of the projection 602 for terminal areas formed on the conductor circuit pattern 601, and as shown in the left figure of drawing 6, as shown in [in the right figure of drawing 6], into the solder tub 603 by which heat melting is carried out, it forms the soldering arrival portion 603.

(**) As shown in the left figure of drawing 7, when the terminal area projection 703 is formed with plating on the conductor circuit pattern 701 using the plating resist 702 for terminal area formation, Still as shown in [in the right figure of drawing 7], using the plating resist 702, electrolysis solder plating may be performed and the soldering arrival portion 704 may be formed at the tip of the terminal area projection 703.

Although the solder to be used mentions the reason later, its solder of the presentation with the

melting point high not less than about 10 ** is better than the curing temperature of the resin currently used for business, such as insulation layer 120,130 between conductor tubs --.
[0017]The mimetic diagram shown by a-d of drawing 8 explains the situation of the important section of each member at the time of the press at the time of applying solder to the tip part of a terminal area projection as shown in drawing 5 - drawing 7. In this case, the top insulation layer 820 in which the top circuit pattern 821 was formed for simplification of explanation, The case where heat pressing is carried out about the resin sheet 810 for insulators and the lower insulation layer 800 which has the soldering arrival portion 803 at the tip of the terminal area projection 802 formed in the lower circuit pattern 801 is shown.
In a), although a figure shows the array state before a press, the soldering arrival portion 803 is in a solid state.
In b), if heat pressing runs, temperature rises gradually from ordinary temperature and the temperature of insulator resin exceeds glass transition temperature with the heat supplied, resin will come to become soft.
c) Soon, it will be in a flow state, the portion of resin will be gelled if temperature rises further, and if it finally reaches curing temperature, it will become a solid. During this progress, the soldering arrival portion 803 has sufficient hardness to break through the resin sheet 810 for insulators until it becomes melting temperature with a curing temperature of +10 **. And the soldering arrival portion 803 breaks through the resin sheet 810 for insulators, and is welded by pressure to the top circuit pattern 821 of the conductor layer of the other party. 811 is the resin part solidified after melting.
d) If it becomes the temperature which solder fuses with the heat supplied further, it will become the solder portion 804 which solder fused and fused.
And if it ends like the press operator shown by above-mentioned a-d and the whole is cooled, the tip and the top circuit pattern 821 of the terminal area projection 802 will come to be firmly connected by the solidified solder.
[0018]In the case of the example of drawing 1, the 2nd and 3rd conductor layer indirect continued use projection 122, the 3rd conductor layer 131 and the 3rd and 4th conductor layer indirect continued use projection 132, and the 4th conductor layer 141 are stuck by pressure like ****. (b) of drawing 1 shows the substrate section after the end of a press. 160 is the resin layer which the whole insulation layer fused and was solidified after the end of a press. Then, the multilayer substrate of drawing 1 as shown in (b) is completed by exfoliating the unnecessary bottom stainless steel stand 110 and the upper part stainless steel stand 150. Since the surface of the bottom stainless steel stand 110 and the upper part stainless steel stand 150 is mirror finish, it can exfoliate easily also after a press. If needed, solder resist and Hitoshi Handa are applied to the portion exposed to the exterior of the 1st conductor layer 111 or 4th conductor layer 141 grade, and finishing is ended into it.
[0019]Although how the projection for the electrical links of an up-and-down layer breaks through the resin layer of an insulator is taken in this example, As the hole which is not the thing to restrict to this but a grade along which a projection passes in the position to break through, for example is beforehand made with a drill, laser, etc., and a projection is inserted in the hole and it is crowded, it may put according to an above-mentioned example. The schematic diagram of drawing 3 explains the point in the case of such a method. 311 is a lower conductor circuit pattern and 312 is the projection for connection for electrically connecting the lower conductor circuit pattern 311 and a top conductor circuit pattern (not shown). Projection 312 for connection, it inserts in, and it is crowded, and is a hole of business and 313 is an insulation layer resin sheet in which 320 has the hole 313. Although detailed explanation is omitted, the electrical link between the impossible conductor circuit patterns in a press which are not becomes possible with this method.
[0020](The 2nd example) Drawing 2 is a substrate constitution explanatory view showing the 2nd example of this invention, a left-hand side figure (a) shows the state before press forming, and the right-hand side figure (b) shows the state after press forming. This example is characterized by the thing of the 1st example for which business was shown once and the conductor layer and the terminal area projection were provided in both sides of one resin made from an insulation. In

the figure, 210 is a tabular bottom stainless steel stand for forming the 1st conductor layer 211 that constitutes the circuit pattern, and the surface is made from the existing metal of the conductivity of the stainless steel etc. which performed mirror finish so that resin and a copper material may exfoliate easily in a final process. This bottom stainless steel stand 210 carries out not only the stand for forming the 1st conductor layer 211 but the duty of the press board of the bottom press jig in the case of heat pressing, thickness is required for it at least 1 mm, and it is required to be smooth in the surface without curvature. And although the method by electrolysis plating with which the formation used plating resist although the 1st conductor layer 211 used as a circuit pattern was formed in the smooth side of the bottom stainless steel stand 210 may be used, the method by printing by the screen version using a paste etc., etc. may be used, for example.

[0021]The insulation layer 220 between the 1st and 2nd conductor layer is a sheet which consists of insulating resin, and is a sheet for substrates used in order to plan electric insulation between the 1st conductor layer 211 and the 2nd conductor layer 221. The thickness is the thickness part necessity for the insulating layer provided in the design specification of the substrate which it is going to manufacture.

[0022]The insulation layer 230 between the 2nd and 3rd conductor layer is a sheet which consists of insulating resin, and is a sheet for substrates used in order to plan electric insulation between the 2nd conductor layer 221 and the 3rd conductor layer 231. The thickness is the thickness part necessity for the insulating layer provided in the design specification of the substrate which it is going to manufacture. The 2nd conductor layer 221 and the 3rd conductor layer 231, the 1st and 2nd conductor layer indirect continued use projection 222, and the 3rd and 4th conductor layer indirect continued use projection 232 are formed by the same method as the method of having formed the 1st and 2nd conductor layer indirect continued use projection 112 of drawing 1 to both sides of the insulation layer 230 between the 2nd and 3rd conductor layer. The height of these projections 222,232 for connection is the thickness part necessity for the insulating layer provided in the design specification of the substrate which it is going to manufacture.

[0023]The insulation layer 240 between the 3rd and 4th conductor layer is a sheet which consists of insulating resin, and is a member for substrates used in order to plan electric insulation between the 3rd conductor layer 231 and the 4th conductor layer 241. The thickness is the thickness part necessity for the insulating layer provided in the design specification of the substrate which it is going to manufacture. The upper part stainless steel stand 250 is a stand for forming the 4th conductor layer 241 of a circuit pattern, and it is desirable that it is the metal which has in the surface the conductivity of the stainless plate etc. which performed mirror finish so that resin and copper may exfoliate easily at the last process. It is for achieving not only the stand for forming the 4th conductor layer 241 but the duty of the press board in the case of heat pressing, and it is required for thickness at least 1 mm or more, and the upper part stainless steel stand 250 made from this stainless steel does not have curvature, and a thing smooth in the surface is required for it. The besides side stainless steel stand 250 is a thing of the same function as the bottom stainless steel stand 210. And although the method by electrolysis plating with which the formation used plating resist although the 4th conductor layer 241 used as a circuit pattern was formed in the smooth side of the upper part stainless steel stand 250 may be used, the method by printing by the screen version using a paste etc., etc. may be used, for example.

[0024]Also in this case, heat pressing is performed by the same method as the case of the 1st example, and the integral-type multilayer substrate by the resin part 260 solidified after melting is obtained so that (b) of drawing 2 may see. Then, the multilayer substrate of the mold of this example is completed by exfoliating and removing the bottom stainless steel stand 210 and the upper part stainless steel stand 250. In explanation of an above-mentioned example, although the conductor layer explained the substrate of four layers as an example, about the number of conductor layers, it is not restricted to four layers, and the manufacturing method of this invention can be applied to the number of layers of arbitrary integers.

[0025](The 3rd example) This example gives and explains the example of an embodiment of some

formation methods about other modes of especially the structure of a tip part of a terminal area projection. First, as shown in drawing 9, after opposing a terminal area projection and allocating, there is a method which presses and sticks these projections by pressure. For example, as one example of an electrical link, the lower conductor layer 902 and the lower part side terminal area projection 903 are formed on the lower insulation layer 901 at this order, It is a method forms the top conductor layer 905 and the upper part side terminal area projection 904 under the 1 more top insulation layer 906 at this order, opposes the lower part side terminal area projection 903 and the upper part side terminal area projection 904, and presses, and it is made to connect. In this case, it is possible to raise the substrate connectivity after a press remarkably by considering it as the shape which used the tip part as the hook type like the lower part side terminal area projection 1001 shown in drawing 10, and the upper part side terminal area projection 1002.

[0026]Drawing 11 is an explanatory view showing in simple the mechanism which the up-and-down projection shown in drawing 10 connects at the time of a press. In the figure, a of drawing 11 shows the array state before a press, and, as for the tip part of the lower part side terminal area projection 1101, the sliding surface 1106 and the connecting face 1104 are formed. The sliding surface 1105 and the connecting face 1103 were formed at the tip of the upper part side terminal area projection 1102, and up-and-down tip parts have countered it. An arrow shows each pressing direction. the sliding surface 1105 after approaching mutually so that the projection of the upper and lower sides by the pressure at the time of a press may be looked at by b of drawing 11, and 1106 comrades -- ****** -- it becomes like. And it slides contacting by a sliding surface still more nearly mutually, and connection is completed like c of drawing 11 by the appearance which finally gears mutually in the connecting faces 1103 and 1104. While resulting in the above presses and engagement from contact of a projection, since insulating resin of the circumference of a projection is a molten state, it carries out any disturbance to contact of a projection, and operation of slide engagement with the heat at the time of a press. And connection strong against expansion, compression, etc. is attained by such a structure. In order to improve the reliability of connection more, noble metal films, such as gold and platinum, may be provided in a connecting face.

[0027]Here, the formation method of an above-mentioned height is explained. The outline is shown in (a) of drawing 12, and (b). First, as shown in (a) of drawing 12, on the conductor layer 1202 formed in the insulation layer or the stainless steel stand, the plating resist 1201 is used, electrolysis plating is performed, and the projection 1203 for connection without a sliding surface and a connecting face is formed. Next, as shown in (b) of drawing 12, the plating resist 1204 for plating in shape with the sliding surface of shape as shown in drawing 10 is formed. In this case, the hardening reaction at the time of exposure uses a dimerization reaction type thing according to the reason for carrying out detailed explanation of the plating resist 1204 to be used later. Next, it plates and the projection for connection with an ancyloid projection as shown in drawing 10 is formed.

[0028]Drawing 13 explains the reason for using dimerization reaction type resist for plating resist. The whole regist layer does not harden dimerization reaction type resist like a radical reaction type, Several micrometers harden from a resist surface, the resist hardening portion 1304 is only formed, and the structure where the resist ****** portion 1303 of which the resist side attachment wall was scooped out was formed is acquired by the resist uncured part 1305 by development. As shown in drawing 13, lower crimp ****** 1302 is formed in the side-attachment-wall lower part side because lower crimp ****** 1302 has the ground 1301 and strong adhesion. Therefore, as shown in drawing 14, perform the surface treatment which makes a ground reduce this adhesion power beforehand, and the treated membrane 1404 for a resist adhesion fall is formed, By forming a slide and the resist 1405 for engagement side formation on the treated membrane 1404, the technique shown in drawing 13 can be applied, the section formed after the projection 1403 can plate to the space part of trapezoidal shape, and an ancyloid projection can be formed. In the figure, 1402 is the conductor layer formed on the ground, and the projection 1403 is formed on it. And 1401 is the resist for projection formation. In order to form the treated membrane 1404 for an above-mentioned resist adhesion fall, the

method of grinding the 1401st page of the resist for projection formation to the extent that it is close to a mirror plane may be used, and the method of applying a small substance may be sufficient as adhesion with other substances, such as Teflon resin. According to the formation method shown in drawing 14, it slides in all the directions without the necessity for a slide and engagement, and the projection tip part structure for engagement is formed, but it is usable convenient.

[0029]In explanation of the 3rd above-mentioned example, although the shape of a terminal area and its feature were explained, about manufacture of the circuit board, it cannot be overemphasized that the method shown in the 1st or 2nd example using this terminal area is applicable as it is.

[0030]As mentioned above, although the 1st - the 3rd example explained in detail, Constitute the terminal area between up-and-down conductor layers from a projection like a regulus, and are in charge of press formation of a multilayer substrate, ** which the tip and conductor layer of a projection can contact easily, can make sticking by pressure and welding easy, and can manufacture a thin multilayer substrate with simple and sufficient quality compared with the conventional method when a projection breaks through an insulation layer -- it became like. Since it moreover became unnecessary like the manufacturing method of the conventional printed circuit board perforating for the through hole formation by NC drill etc. and the terminal area was constituted from a projection, it became more nearly connectable according to a small area than the path of a drill. Thereby, minuteness making is conjointly attained from that of a plated circuit with an above-mentioned effect.

[0031]

[Effect of the Invention]As explained to details above, according to this invention, the insulation layer between conductor layers for which a multilayer substrate is constituted is formed by the sheet shaped insulator resin layer which does not contain glass fiber, The projection which consists of a conductor for the electrical links between conductor circuit layers is provided on the given place of a conductor circuit layer, A projection breaks through an insulator resin layer with the pressure by pressing this layered product using a press jig board, or, Or it becomes easy to make an insulation layer **** through the hole of the prescribed position which provided the projection in the insulator, Since it is made said conductor circuit layer which counters that you will make it contacted and stuck by pressure and the terminal area is formed, compared with the conventional manufacturing method, the effect that a thinner multilayer printed board can be manufactured with simple and sufficient quality is acquired. Since the minute perforation process for the through hole formation by NC drill etc. became unnecessary and moreover constituted the terminal area from a small projection like [in the conventional multilayer substrate manufacture], it became more nearly connectable according to a small area than the path of a drill. Thereby, the contribution to attaining minuteness making from that of a plated circuit conjointly with an above-mentioned effect is size.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a substrate constitution explanatory view showing the 1st example of this invention, and a left-hand side figure (a) shows the state before press forming, and a right-hand side figure (b) shows the state after press forming.
[Drawing 2]It is a substrate constitution explanatory view showing the 2nd example of this invention, and a left-hand side figure (a) shows the state before press forming, and a right-hand side figure (b) shows the state after press forming.
[Drawing 3]It is an explanatory view showing another mode of terminal area formation of the 1st example of this invention.
[Drawing 4]It is an explanatory view showing the mode of the projection tip part in the 1st example of this invention.
[Drawing 5]It is an explanatory view showing other modes of the projection tip part in the 1st example of this invention.
[Drawing 6]It is an explanatory view showing one formation method of the soldering arrival portion of drawing 5.
[Drawing 7]It is an explanatory view showing other formation methods of the soldering arrival portion of drawing 5.
[Drawing 8]It is an explanatory view showing the situation at the time of press forming by the projection of drawing 5.
[Drawing 9]It is an explanatory view of the projection tip part of the terminal area which shows the 3rd example of this invention.
[Drawing 10]It is a perspective view showing the hook type tip part of the projection which drawing 9 counters.
[Drawing 11]It is an explanatory view showing the connected state of the tip part of drawing 10.
[Drawing 12]It is a section explanatory view showing one formation method of the hook type tip part of a projection of drawing 10.
[Drawing 13]It is an explanatory view showing the principle of other formation methods of the hook type tip part by dimerization resist.
[Drawing 14]It is an explanatory view showing the principle of another formation method of the hook type tip part by dimerization resist.
[Description of Notations]
110,210 Bottom stainless steel stand
111,211 The 1st conductor layer
112 The 1st and 2nd conductor layer indirect continued use projection
120,220 Insulation layer between the 1st and 2nd conductor layer
121,221 The 2nd conductor layer
122 The 2nd and 3rd conductor layer indirect continued use projection
222 The 1st and 2nd conductor layer indirect continued use projection
130,230 Insulation layer between the 2nd and 3rd conductor layer
131,231 The 3rd conductor layer
132,232 The 3rd and 4th conductor layer indirect continued use projection

140,240 Insulation layer between the 3rd and 4th conductor layer
141,241 The 4th conductor layer
150,250 Upper part stainless steel stand
160 The solidified resin layer
260 The resin part solidified after melting
311 Lower conductor circuit pattern
312 The projection for connection
313 Hole
320 Insulation layer resin sheet
401 Conductor circuit pattern
402 The projection for terminal areas
403 Gold (or platinum)
501,601,701 Conductor circuit pattern
502,602,703 Projection for terminal areas
503 Soldering arrival portion
603 Solder tub
702 Plating resist
604,704,803 Soldering arrival portion
800 Lower insulation layer
801 Lower circuit pattern
802 Terminal area projection
804 The fused solder portion
810 The resin sheet for insulators
811 The resin part solidified after melting
820 Top insulation layer
821 Top circuit pattern
901 Lower insulation layer
902 Lower conductor layer
903 Lower part side terminal area projection
904 Upper part side terminal area projection
905 Top conductor layer
906 Top insulation layer
1001 Lower part side terminal area projection
1002 Upper part side terminal area projection
1101 Lower part side terminal area projection
1102 Upper part side terminal area projection
1103-1104 Connecting face
1105-1106 sliding surfaces
1201-1204 plating resist
1202 Conductor layer
1203 The projection for connection
1301 Ground
1302 Lower crimp ******
1303 Resist ****** portion
1304 Resist hardening portion
1305 Resist uncured part
1401 Resist for projection formation
1402 Conductor layer
1403 Projection
1404 Treated membrane
1405 A slide and the resist for engagement side formation

[Translation done.]

* NOTICES *

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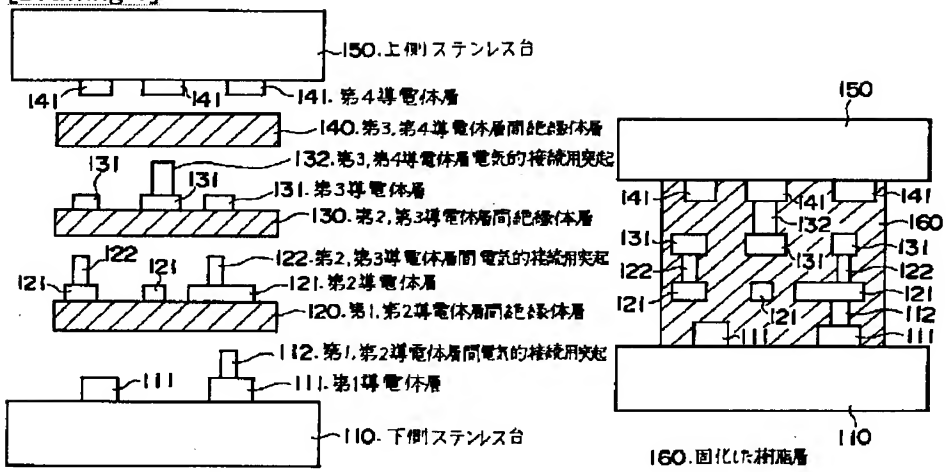
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

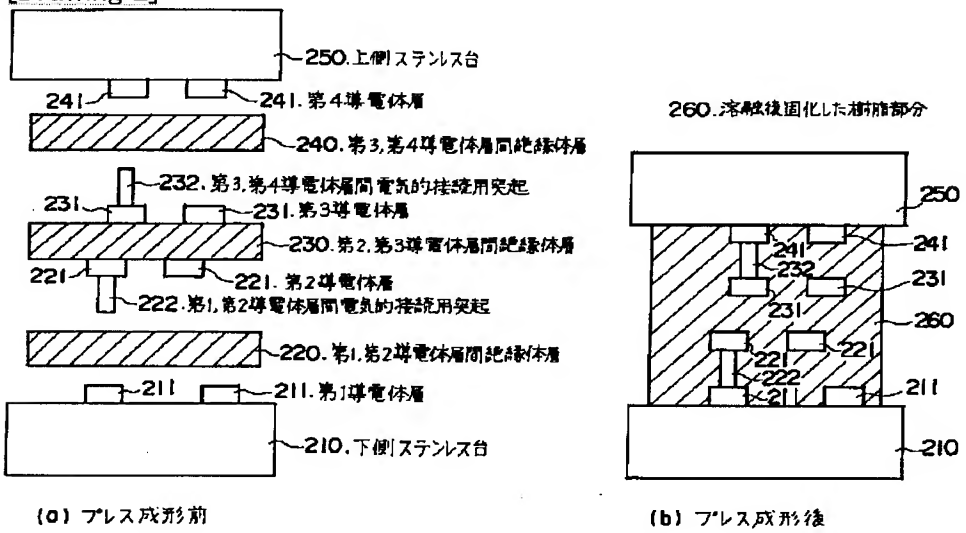
[Drawing 1]



(a) プレス成形前　　(b) プレス成形後

本発明の第１の実施例を示す基板構成説明図

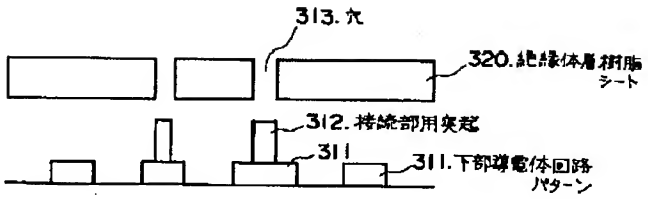
[Drawing 2]



(a) プレス成形前　　(b) プレス成形後

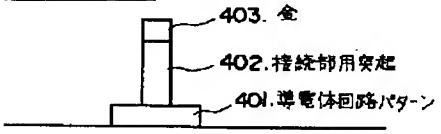
本発明の第２の実施例を示す基板構成説明図

[Drawing 3]



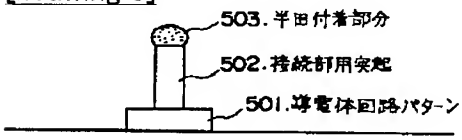
本発明の第１の実施例の接続部形成の態様例

[Drawing 4]



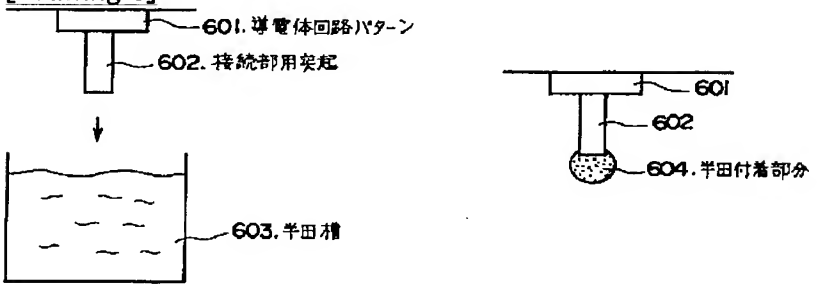
第１の実施例の突起先端部の態様例

[Drawing 5]



第１の実施例の突起先端部の他の態様例

[Drawing 6]



(a) 浸漬前　　(b) 浸漬後

図５の半田付着部分の一形成方法説明図

[Drawing 7]

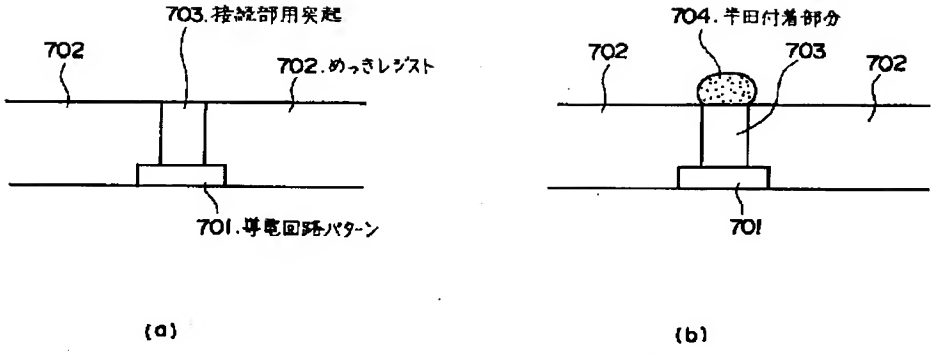
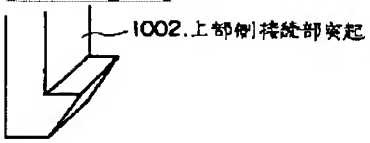


図５の半田付着部分の他の形成方法説明図

[Drawing 10]



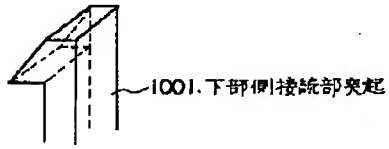


図９の先端部の鉤形突起

[Drawing 8]

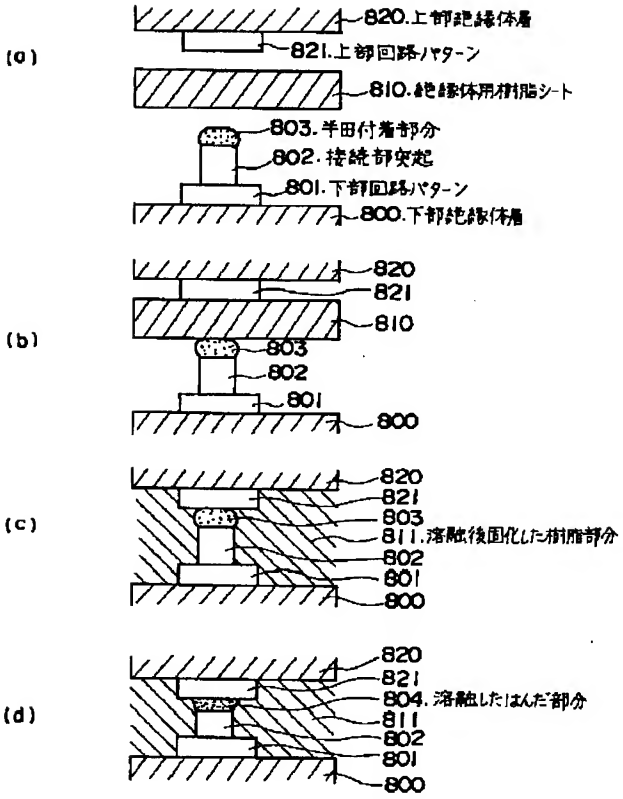
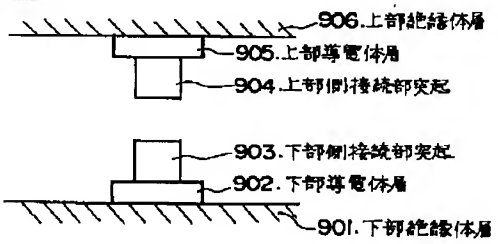


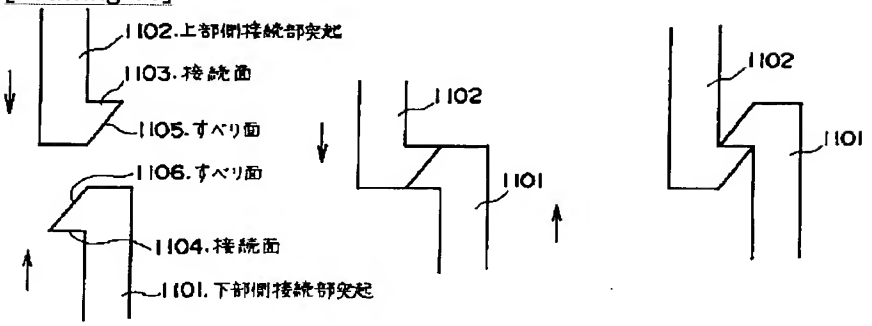
図５の突起によるプレス成形説明図

[Drawing 9]



本発明の第３の実施例を示す突起先端部

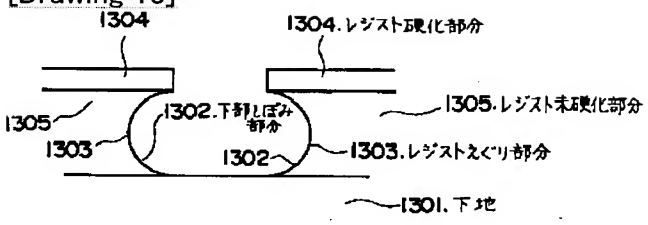
[Drawing 11]



(a) プレス前　　(b) プレス中　　(c) プレス後

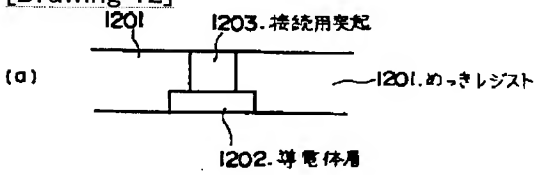
図１０の先端部の接続状態説明図

[Drawing 13]



本発明の二量化レジストによる鉤形先端部の一形成方法

[Drawing 12]



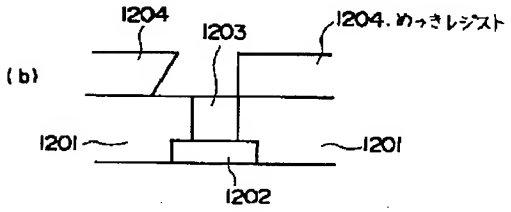
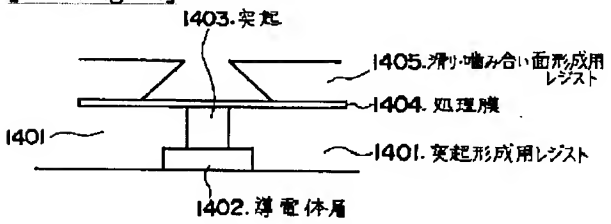


図１０の先端部の一形成方法説明図

[Drawing 14]



二量化レジストによる鉤形先端部の別の形成方法

[Translation done.]

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		Ｂ　6921－4E		

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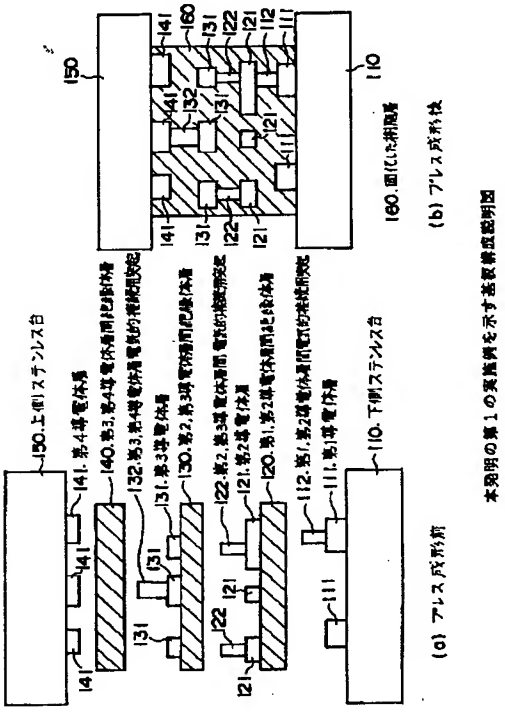
最終頁に続く

(54)【発明の名称】　プリント回路基板の製造方法

(57)【要約】

【目的】　基板の小型化、薄型化及び上下導体層の電気的接続部の小面積化にも対応できるプリント回路基板の製造方法を得る。

【構成】　両面又は片面に導電体回路層を有する絶縁体層１２０等と導電体回路層を有しない絶縁体層１４０との積層体を、プレス治具板１１０等を用いて両端面から加圧・成形し、同時に所定の少なくとも上下２つの導電体回路層を電気的に接続させて、絶縁体層をいずれもガラス繊維を含まないシート状の絶縁体樹脂層１２０等で形成し、導電体回路層の所定場所上に導電体回路層間の電気的接続用の導電体からなる突起１１２等を設けておき、プレスによる圧力によって絶縁体樹脂層を突起が突き破り、対向する導電体回路層に当接・圧着させる方法。



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【特許請求の範囲】

【請求項１】　両面又は片面に導電体回路層を有する絶縁体層と導電体回路層を有しない前記絶縁体層とを所定数積み重ねた積層体を、前記導電体回路層を有するプレス治具板を用いて両端面から加圧・成形し、同時に所定の少なくとも上下２つの前記導電体回路層を電気的に接続させて多層プリント基板を形成するプリント回路基板の製造方法において、

前記絶縁体層をいずれもガラス繊維を含まないシート状の絶縁体樹脂層で形成し、

前記導電体回路層の所定場所上に前記導電体回路層間の電気的接続用の導電体からなる突起を設けておき、

前記積層体を前記プレス治具板を用いてプレスを行うことによる圧力によって前記絶縁体樹脂層を前記突起が突き破り、対向する前記導電体回路層に当接・圧着させることを特徴とするプリント回路基板の製造方法。

【請求項２】　前記絶縁体樹脂層を前記突起が突き破る手段において、前記圧力に加えて、前記絶縁体樹脂層の溶融温度まで加熱して前記突起の突き破りを容易にすることを特徴とする請求項１記載のプリント回路基板の製造方法。

【請求項３】　前記絶縁体樹脂層を前記突起が突き破る手段の代りに、前記突起が突き破る位置に予め前記突起が通る大きさの穴を開けておき、プレス時に前記突起が前記穴を通って対向する前記導電体回路層に当接・圧着させることを特徴とする請求項１記載のプリント回路基板の製造方法。

【請求項４】　前記突起の先端部に、前記絶縁体樹脂層の樹脂硬化温度より高い溶融温度を有する半田層を設けておき、前記熱及び圧力で前記絶縁体樹脂層を前記突起で突き破り前記半田層を前記導電体回路層に圧接させ、前記絶縁体樹脂層を硬化させた後、この状態で温度を前記半田の溶融温度まで上昇し前記半田層を溶融させて前記突起を前記導電体回路層に接続させた後、冷却して前記半田層を固化させることを特徴とする請求項２記載のプリント回路基板の製造方法。

【請求項５】　接続部を構成する前記導電体回路層上に設けた前記突起をその先端部が対向するように上下の絶縁体樹脂層の同位置に設け、前記突起の先端部に前記接続部がプレス時に互いに接触しつつ滑り合う面と、互いに噛み合い、引っ掛かり合い接触する面を設けていることを特徴とする請求項２記載のプリント回路基板の製造方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明はプリント回路基板の製造方法に関し、特に一枚の基板の厚さ方向に多数の導体配線層を有する多層プリント基板と呼ばれているプリント回路基板の製造方法に関するものである。

【０００２】

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【従来の技術】この種のプリント回路基板に関しては、例えば、文献；プリント基板技術とその品質保証：応用技術出版（株）刊、情報技術センター発売、（昭和５５年８月２７日発行）の第８章に詳説されている。

【０００３】従来、プリント回路基板の製造においては、ガラス繊維を布状に織りあげたシート状板に絶縁性の樹脂を含浸させたシートの片面又は両面に銅箔を貼り付けた銅張積層板や、ガラス繊維を布状に織りあげたシート状板に絶縁性の樹脂を含浸させたシート状の絶縁材料に銅箔を貼り付けた銅箔プリプレグ等を使用し、これらの銅箔部分をエッチングする等の技術により、必要な回路を形成する方法を採用していた。

【０００４】また、上述のような単層基板の外に、銅の層を多数持っている前述の多層基板の製造の場合には、銅の回路層間の電気回路的接続が必要である。このような層間の接続のためには、厚さ方向に貫通するスルーホールを形成し、その内壁をめっき等の方法で導電性膜でコーティングし、かつ接続の必要な層と電気的に接続させる構造となっている。この為、所要の場所にスルーホールを設けるためにドリル等で基板に穴を空ける必要があった。そして、これらの手法により回路形成が完了した材料を積み重ねて、熱と圧力によりプレスして多層基板を製造する方法が主流となっていた。

【０００５】

【発明が解決しようとする課題】上述のような従来のプリント回路基板の製造方法では、最新技術における要請のように、基板のサイズが小形化、薄型化し、層間の厚さも薄くなり、さらにスルーホールの穴径も非常に小さくなつている場合には、次に箇条書きするような幾つかの問題が生じていた。

（１）銅張積層板やプリプレグを構成しているガラス繊維が、スルーホールの穴あけにおけるドリル加工の障害になる。

（２）ガラス繊維がドリルの刃を傷めるため、ドリルの刃の寿命を著しく縮め、特に穴径が小さい場合は、ドリルの折損等により、ドリルの刃代等のコストがかさむ。

（３）ドリルやレーザー加工等の方法では、加工可能穴径に限界がある。

（４）小径スルーホール内のめっき及びその前処理工程で、スルーホール径が小さくなると、めっき液や処理液が穴の中に入らないためにめっきが形成されず、導通不良となる。

そして、これらの問題点によって、プリント回路基板の製造が難しくなり、不良の発生する確率も高くなり、さらに進むと、前述の製造方法では製造が困難になる等の問題があった。

【０００６】

【課題を解決するための手段】本発明に係るプリント回路基板の製造方法は、両面又は片面に導電体回路層を有する絶縁体層と導電体回路層を有しない絶縁体層とを所

定数積み重ねた積層体を、導電体回路層を有するプレス治具板を用いて両端面から加圧・成形し、同時に所定の少なくとも上下２つの導電体回路層を電気的に接続させて多層プリント基板を形成するプリント回路基板の製造方法において、絶縁体層をいずれもガラス繊維を含まないシート状の絶縁体樹脂層で形成し、導電体回路層の所定場所上に導電体回路層間の電気的接続用の導電体からなる突起を設けておき、積層体をプレス治具板を用いてプレスを行うことによる圧力によって絶縁体樹脂層を突起が突き破り、対向する導電体回路層に当接・圧着させるものである。

【０００７】そして、前記の絶縁体樹脂層を突起が突き破る手段において、圧力に加えて、絶縁体樹脂層の溶融温度まで加熱して突起の突き破りを容易にする製造方法であってもよく、これとは別に、絶縁体樹脂層を突起が突き破る手段の代りに、突起が突き破る位置に予め突起が通る大きさの穴を開けておき、プレス時に突起が穴を通って対向する導電体回路層に当接・圧着させるようにしてもよい。さらに、突起の先端部に、絶縁体樹脂層の樹脂硬化温度より高い溶融温度を有する半田層を設けておき、熱及び圧力で絶縁体樹脂層を突起で突き破り半田層を導電体回路層に圧接させ、絶縁体樹脂層を硬化させた後、この状態で温度を半田の溶融温度まで上昇し半田層を溶融させて突起を導電体回路層に接続させた後、冷却して半田層を固化させる製造方法でもよい。また、接続部を構成する導電体回路層上に形成した突起をその先端部が対向するように上下の絶縁体樹脂層の同位置に設け、突起の先端部に接続部がプレス時に互いに接触しつつ滑り合う面と、互いに噛み合い、引っ掛かり合い接触する面を設けている突起部構造のものを使用してもよい。

【０００８】

【作用】本発明においては、両面又は片面に導電体回路層を有する絶縁体層と導電体回路層を有しない絶縁体層とを所定数積み重ねた積層体を、加圧・成形し、同時に所定の少なくとも上下２つの導電体回路層を電気的に接続させるプリント回路基板の製造方法において、絶縁体層をいずれもガラス繊維を含まないシート状の絶縁体樹脂層で形成し、導電体回路層の所定場所上に導電体回路層間の電気的接続用の導電体からなる突起（金属塊）を設けておき、積層体をプレス治具板を用いてプレスを行うものである。そのため、従来の繊維を含むシート状の絶縁体樹脂材料（プリプレグ）を使用していたのに比べ、プレス圧力によって絶縁体樹脂層の突起による突き破りができるようになり、これを利用して、対向する導電体回路層に突起部を当接・圧着させるので、従来のスルーホールによる接続部の形成より、接続部を薄くかつ小径（小面積）で形成できるようになる。

【０００９】

【実施例】

（第１の実施例）図１は本発明の第１の実施例を示す基板構成説明図であり、左側図（ａ）はプレス成形前の状態、右側図（ｂ）はプレス成形後の状態を示している。１１０は回路パターンを構成している第１導電体層１１１を形成するための板状の下側ステンレス台であり、最終工程で樹脂及び銅材が剥離し易いように表面を鏡面仕上げを行ったステンレス鋼（以下ステンレスという）等の導電性のある金属で作られている。なお、この下側ステンレス台１１０は第１導電体層１１１を形成するための台だけでなく、熱プレスの際の下側プレス治具のプレス板の役目もするもので、厚さは少なくとも１ｍｍ必要であり、反りのない表面が平滑なものであることが必要である。そして、下側ステンレス台１１０の平滑面に回路パターンとなる第１導電体層１１１を形成するが、その形成はめっきレジストを用いた電解めっきによる方法でよいが、例えばペースト等を用いたスクリーン版等による印刷による方法でもよい。

【００１０】形成した第１導電体層１１１の所定場所上に、第１、第２導電体層間接続用突起１１２を形成する。第１、第２導電体層間接続用突起１１２の形成は、第１導電体層１１１を形成した後に行ってもよいが、第１導電体層１１１の形成時に同時に行ってもよい。この第１、第２導電体層間接続用突起１１２の形成方法は、第１導電体層１１１の形成方法と同じで、めっきレジストを用いた電解めっきによる方法で形成しても、導電性ペースト等を用いてスクリーン製版による印刷、又はディスペンサー等による方法でもよい。第１、第２導電体層間接続用突起１１２の高さは、製造しようとしている基板の設計仕様に定められる絶縁層の厚さ分必要である。

【００１１】第１、第２導電体層間絶縁体層１２０は、絶縁性樹脂よりなるシートで、第１導電体層１１１と第２導電体層１２１との間の電気的絶縁を図るために用いる基板用部材である。その厚さは、製造しようとしている基板の設計仕様に定められる絶縁層の厚さ分必要である。第１、第２導電体層間絶縁体層１２０の所定場所上に、第１、第２導電体層間接続用突起１１２を形成した方法と同じ方法により、第２導電体層１２１と第２、第３導電体層間接続用突起１２２を形成する。第２、第３導電体層間接続用突起１２２の高さは、製造しようとしている基板の設計仕様に定められる絶縁層の厚さ分必要である。

【００１２】第２、第３導電体層間絶縁体層１３０は、絶縁性樹脂よりなるシートで、第２導電体層１２１と第３導電体層１３１との間の電気的絶縁を図るために用いる基板用部材である。その厚さは、製造しようとしている基板の設計仕様に定められる絶縁層の厚さ分必要である。第２、第３導電体層間絶縁体層１３０の所定場所上に、第１、第２導電体層間接続用突起１１２を形成した方法と同じ方法により、第３導電体層１３１と第３、第

４導電体層間接続用突起１３２を形成する。第３、第４導電体層間接続用突起１３２の高さは、製造しようとしている基板の設計仕様に定められる絶縁層の厚さ分必要である。

【００１３】第３、第４導電体層間絶縁体層１４０は、絶縁性樹脂よりなるシートで、第３導電体層１３１と第４導電体層１４１との間の電気的絶縁を図るために用いる基板用部材である。その厚さは、製造しようとしている基板の設計仕様に定められる絶縁層の厚さ分必要である。上側ステンレス台１５０は回路パターンの第４導電体層１４１を形成するための台であり、最後の工程で樹脂及び銅が剥離し易いように、表面を鏡面仕上げを行ったステンレス板等の導電性のある金属製であることが望ましい。なお、このステンレス製の上側ステンレス台１５０は第４導電体層１４１を形成するための台だけでなく、熱プレスの際のプレス板の役目も果たすためのものであり、厚さは少なくとも１ｍｍ以上必要で、かつ反りがなく、表面が平滑であるものが必要である。従って、この上側ステンレス台１５０は、下側ステンレス台１１０と同一機能のものである。そして、上側ステンレス台１５０の平滑面に回路パターンとなる第４導電体層１４１を形成するが、その形成はめっきレジストを用いた電解めっきによる方法でよいが、例えばペースト等を用いたスクリーン版等による印刷による方法でもよい。なお、図１は第４導電体層１４１形成後の状態を示しているが、基板層の構成や製造方法の説明の便宜上、天地反転して図示している。

【００１４】上述のようにして準備された図１に示す部品番号１１０から１５０までの部材を位置精度よく積み重ねた後、熱プレスによりプレスして、一枚の多層基板を形成する。プレス時に印加する温度は、第１、第２導電体層間絶縁体層１２０、第２、第３導電体層間絶縁体層１３０及び第３、第４導電体層間絶縁体層１４０に使用される絶縁体材料の種類により異なるが、一般的には使用する樹脂のガラス転移温度＋２０～３０℃程度が最適である。例えば、エポキシ樹脂の場合は大体、１７０～１８０℃程度である。プレスの時間は、第１、第２導電体層間絶縁体層１２０、第２、第３導電体層間絶縁体層１３０及び第３、第４導電体層間絶縁体層１４０が溶融し導体回路パターンの間隙に隙間なく流れ込むための時間が必要で、概ね１００分程度必要である。そして、プレスの加圧力は２５ｋｇ／ｃｍ^{2}程度が必要である。

【００１５】上述のようなプレス操作により、第１、第２導電体層間接続用突起１１２、第２、第３導電体層間接続用突起１２２及び第３、第４導電体層間接続用突起１３２は、それぞれ第１、第２導電体層間絶縁体層１２０、第２、第３導電体層間絶縁体層１３０及び第３、第４導電体層間絶縁体層１４０を突き破り、図１の（ｂ）に示されるように、それぞれ第２導電体層１２１、第３導電体層１３１及び第４導電体層１４１にしっかり圧着

されるようになる。そして、それぞれ十分な電気的接続を取ることが可能となる。この場合、接続の信頼性をより高めるために、図４に示すように、導電体回路パターン４０１上の接続部用突起４０２の先端部を、金４０３又は白金（４０３）等の貴金属で覆うようにしてもよい。なお、各突起が絶縁体層を突き破る際には、熱プレスより供給される熱により、絶縁層の樹脂自体も軟化しているので、非常に滑らかに各絶縁層樹脂を突き破ることが可能である。突き破りが完了した後も、絶縁層樹脂自体が溶融しているため、突起の周囲は空隙なく樹脂によって埋め込まれるため、多層基板としての品質も良好なものとなる。

【００１６】また、その他の方法として図５に示すように、適当な方法で各導電体回路パターン５０１上に形成された接続部用突起５０２の先端部に半田を塗布して半田付着部分５０３を形成したものとし、各層をプレスしてもよい。この場合の半田の塗布方法として、次の（イ），（ロ）に示す２つの方法が好適である。

（イ）図６の左図に示すように、半田が加熱溶融されている半田槽６０３中に、導電体回路パターン６０１上に形成された接続部用突起６０２の先端のみを浸漬し、図６の右図のように半田付着部分６０３を形成する。

（ロ）図７の左図に示すように、導電体回路パターン７０１上に接続部形成用のめっきレジスト７０２を使用して接続部突起７０３をめっきにより形成した場合には、さらに図７の右図のように、そのめっきレジスト７０２を利用して、電解半田めっきを行って接続部突起７０３の先端に半田付着部分７０４を形成してもよい。

使用する半田は、その理由を後述するが、各導電体槽間絶縁体層１２０，１３０…等用に使用されている樹脂の硬化温度より、１０℃程度以上高い融点を持つ組成の半田がよい。

【００１７】図５～図７に示したような接続部突起の先端部に半田を塗布した場合のプレス時の各部材の要部の様子を、図８のａ）～ｄ）で示す模式図によって説明する。この場合説明の簡略化のために、上部回路パターン８２１が形成された上部絶縁体層８２０と、絶縁体用樹脂シート８１０と、下部回路パターン８０１に形成された接続部突起８０２の先端に半田付着部分８０３を有する下部絶縁体層８００とについて、熱プレスする場合について示す。

ａ）において、図はプレス前の配列状態を示すが、半田付着部分８０３は固体の状態である。

ｂ）では、熱プレスが進行して、供給されてくる熱によって、常温から徐々に温度が上昇し、絶縁体樹脂の温度がガラス転移温度を越えると、樹脂が軟化してくるようになる。

ｃ）やがて、樹脂の部分は流動状態となり、さらに温度が上昇するとゲル化し、最後に硬化温度に達すると固体になる。この経過中において、半田付着部分８０３は、

硬化温度＋１０℃の溶融温度になるまでは絶縁体用樹脂シート８１０を突き破るに充分な硬さを有している。そして、半田付着部分８０３が絶縁体用樹脂シート８１０を突き破り、相手側の導電体層の上部回路パターン８２１に圧接される。なお、８１１は溶融後固化した樹脂部分である。

ｄ）さらに供給されてくる熱により、半田が溶融する温度になると、半田が溶融して溶融した半田部分８０４となる。

そして、上記のａ）～ｄ）で示すプレス工程が終了し全体が冷却されると、接続部突起８０２の先端と上部回路パターン８２１とは固化した半田により強固に接続されるようになる。

【００１８】図１の実施例の場合は、上述と同様にして、第２、第３導電体層間接続用突起１２２と第３導電体層１３１、第３、第４導電体層間接続用突起１３２と第４導電体層１４１とが圧着される。図１の（ｂ）はプレス終了後の基板断面を示すものである。なお、１６０は全体の絶縁体層が溶融してプレス終了後の固化した樹脂層である。その後、不要な下側ステンレス台１１０及び上側ステンレス台１５０を剥離することにより図１の（ｂ）のような多層基板が完成する。下側ステンレス台１１０及び上側ステンレス台１５０の表面は鏡面仕上げになっているので、プレス後でも簡単に剥離が可能である。また、第１導電体層１１１や第４導電体層１４１等の外部に露出した部分には、必要に応じて、ソルダレジスト及び半田等を塗布して仕上げを終了する。

【００１９】なお、本実施例においては、絶縁体の樹脂層を上下層の電気的接続用の突起が突き破る方法をとっているが、これに限るものではなく、例えば、突き破る位置に突起が通る程度の穴を、ドリルやレーザー等により予め開けておき、その穴に突起をはめこむようにして、上述の実施例に準じて積み重ねていってもよい。このような方式の場合の要領を図３の概要図によって説明する。３１１は下部導電体回路パターンであり、３１２は下部導電体回路パターン３１１と上部導電体回路パターン（図示せず）を電気的に接続するための接続用突起である。また、３１３は接続用突起３１２はめこみ用の穴であり、３２０は穴３１３を有する絶縁体層樹脂シートである。詳細説明は省略するが、この方式により、プレスにおける無理のない導電体回路パターン間の電気的接続が可能となる。

【００２０】（第２の実施例）図２は本発明の第２の実施例を示す基板構成説明図であり、左側図（ａ）はプレス成形前の状態、右側図（ｂ）はプレス成形後の状態を示している。本実施例は第１の実施例の一応用を示し、１つの絶縁製樹脂の両面に導電体層及び接続部突起を設けたことを特徴とするものである。図において、２１０は回路パターンを構成している第１導電体層２１１を形成するための板状の下側ステンレス台であり、最終工程

で樹脂及び銅材が剥離し易いように表面を鏡面仕上げを行ったステンレス等の導電性のある金属で作られている。なお、この下側ステンレス台２１０は第１導電体層２１１を形成するための台だけでなく、熱プレスの際の下側プレス治具のプレス板の役目もするもので、厚さは少なくとも１ｍｍ必要であり、反りのない表面が平滑なものであることが必要である。そして、下側ステンレス台２１０の平滑面に回路パターンとなる第１導電体層２１１を形成するが、その形成はめっきレジストを用いた電解めっきによる方法でよいが、例えばペースト等を用いたスクリーン版等による印刷による方法でもよい。

【００２１】第１、第２導電体層間絶縁体層２２０は、絶縁性樹脂よりなるシートで、第１導電体層２１１と第２導電体層２２１との間の電気的絶縁を図るために用いる基板用シートである。その厚さは、製造しようとしている基板の設計仕様に定められる絶縁層の厚さ分必要である。

【００２２】第２、第３導電体層間絶縁体層２３０は、絶縁性樹脂よりなるシートで、第２導電体層２２１と第３導電体層２３１との間の電気的絶縁を図るために用いる基板用シートである。その厚さは、製造しようとしている基板の設計仕様に定められる絶縁層の厚さ分必要である。第２、第３導電体層間絶縁体層２３０の両面に、図１の第１、第２導電体層間接続用突起１１２を形成した方法と同じ方法により第２導電体層２２１及び第３導電体層２３１と第１、第２導電体層間接続用突起２２２と第３、第４導電体層間接続用突起２３２を形成する。これらの接続用突起２２２，２３２の高さは、製造しようとしている基板の設計仕様に定められる絶縁層の厚さ分必要である。

【００２３】第３、第４導電体層間絶縁体層２４０は、絶縁性樹脂よりなるシートで、第３導電体層２３１と第４導電体層２４１との間の電気的絶縁を図るために用いる基板用部材である。その厚さは、製造しようとしている基板の設計仕様に定められる絶縁層の厚さ分必要である。上側ステンレス台２５０は回路パターンの第４導電体層２４１を形成するための台であり、最後の工程で樹脂及び銅が剥離し易いように、表面を鏡面仕上げを行ったステンレス板等の導電性のある金属製であることが望ましい。なお、このステンレス製の上側ステンレス台２５０は第４導電体層２４１を形成するための台だけでなく、熱プレスの際のプレス板の役目も果たすためのものであり、厚さは少なくとも１ｍｍ以上必要で、かつ反りがなく、表面が平滑であるものが必要である。この上側ステンレス台２５０は、下側ステンレス台２１０と同一機能のものである。そして、上側ステンレス台２５０の平滑面に回路パターンとなる第４導電体層２４１を形成するが、その形成はめっきレジストを用いた電解めっきによる方法でよいが、例えばペースト等を用いたスクリーン版等による印刷による方法でもよい。

【００２４】この場合も、第１の実施例の場合と同様な方法で熱プレスを行い、図２の（ｂ）に見られるように、溶融後固化した樹脂部分２６０による一体型多層基板が得られる。その後、下側ステンレス台２１０及び上側ステンレス台２５０を剥離・除去することにより、本実施例の型の多層基板が完成する。なお、上述の実施例の説明においては、導電体層が４層の基板を例として説明したが、導電体層の数については４層に限られるものではなく、任意の整数の層数について本発明の製造方法が適用可能である。

【００２５】（第３の実施例）本実施例では、接続部突起の特に先端部の構造の他の態様について、幾つかの形成方法の実施態様例を挙げて説明する。まず、図９に示すように、接続部突起を向き合わせて配設した後、プレスしてこれらの突起同士を圧着する方式がある。例えば１つの電気的接続例として、下部絶縁体層９０１の上に下部導電体層９０２と下部側接続部突起９０３をこの順に形成し、もう１つ上部絶縁体層９０６の下に上部導電体層９０５と上部側接続部突起９０４をこの順に形成し、下部側接続部突起９０３と上部側接続部突起９０４とを向き合わせてプレスし、接続するようにする方式である。この場合、図１０に示す下部側接続部突起１００１及び上部側接続部突起１００２のように、先端部を鉤型にした形状とすることにより、プレス後の基板接続性を著しく向上させることが可能である。

【００２６】図１１は、図１０に示した上下突起がプレス時に接続するメカニズムを簡略的に示す説明図である。図において、図１１のａ）はプレス前の配列状態を示し、下部側接続部突起１１０１の先端部はすべり面１１０６と接続面１１０４が形成されている。また、上部側接続部突起１１０２の先端には、すべり面１１０５と接続面１１０３が形成されて上下の先端部同士が対向している。なお、矢印はそれぞれのプレス方向を示すものである。プレス時の圧力で上下の突起は、図１１のｂ）に見られるように、互いに接近した後、すべり面１１０５、１１０６同士で接触するようになる。そして、さらに互いにすべり面で接触しながら滑り、図１１のｃ）のように、最後にお互いに接続面１１０３、１１０４で噛み合う格好で接続が完了する。上述のようなプレス及び突起の接触から噛み合いにいたる間、突起周囲の絶縁性の樹脂はプレス時の熱によって溶融状態であるので、突起の接触、滑り噛み合いの動作に対して何等の妨害をしないようになっている。そして、このような構造により、膨脹、圧縮等にも強い接続が可能となる。なお、接続の信頼性をより高めるため、接続面に金、白金等の貴金属膜を設けてもよい。

【００２７】ここで、上述の突起部の形成方法について説明する。その概略を図１２の（ａ）、（ｂ）に示す。まず、図１２の（ａ）のように、絶縁体層又はステンレス台に形成された導電体層１２０２の上に、めっきレジスト１２０１を用いて電解めっきを行い、まず、すべり面、接続面のない接続用突起１２０３を形成する。次に、図１２の（ｂ）に示すように、図１０に示したような形状のすべり面を持つ形状にめっきするためのめっきレジスト１２０４を形成する。この場合、使用するめっきレジスト１２０４は、後で詳細説明する理由により、露光時の硬化反応が二量化反応タイプのものを使用する。次にめっきを行って、図１０に示すような鉤形突起を持った接続用突起が形成される。

【００２８】めっきレジストに二量化反応タイプのレジストを用いる理由を図１３によって説明する。二量化反応タイプのレジストはラジカル反応タイプのようにレジスト層全体が硬化するのではなく、レジスト表面から数μｍが硬化してレジスト硬化部分１３０４を形成するだけであり、現像によってレジスト未硬化部分１３０５にはレジスト側壁がえぐられたレジストえぐり部分１３０３が形成された構造が得られる。図１３に示すように側壁下部側に下部しぼり部分１３０２が形成されるのは、下部しぼみ部分１３０２が下地１３０１と強い密着性を持つためである。従って、図１４に示すように、予め下地にこの密着力を低減させる表面処理を行ってレジスト密着性低下用の処理膜１４０４を形成しておき、処理膜１４０４の上に滑り・噛み合い面形成用レジスト１４０５を形成しておくことによって、図１３に示した手法を適用して、突起１４０３の上に形成した断面が台形状の空間部にめっきして、鉤形突起を形成することができる。なお、図において、１４０２は下地の上に形成された導電体層であり、その上に突起１４０３が形成されている。そして、１４０１は突起形成用レジストである。上述のレジスト密着性低下用の処理膜１４０４を形成するには、突起形成用レジスト１４０１面を鏡面に近いくらい研磨する方法でもよいし、テフロン樹脂等の他の物質との密着性が小さい物質を塗布する等の方法でもよい。図１４に示す形成方法によれば、滑り・噛み合いの必要のない全方向に滑り噛み合い用の突起先端部構造が形成されるが、支障なく使用可能である。

【００２９】上述の第３の実施例の説明においては、接続部の形状及びその特徴に関してのみ説明を行ったが、回路基板の製造については、この接続部を用いて第１又は第２の実施例で示した方法をそのまま適用できることは言うまでもない。

【００３０】以上、第１～第３の実施例によって詳細に説明したが、上下の各導電体層間の接続部を金属塊様の突起で構成し、多層基板のプレス形成に当たって、突起が絶縁体層を突き破ることによって突起の先端と導電体層とが容易に当接し、圧着、溶着を容易にすることができ、従来方法に比べて薄い多層基板を、簡便にかつ品質よく製作できるるようになった。その上、従来のプリント回路基板の製造方法のように、ＮＣドリル等によるスルーホール形成のための穴開けが不要となり、かつ接続

部を突起で構成するから、ドリルの径よりも小面積による接続が可能となった。これにより、上述の効果と相俟って基板回路のより微細化が達成される。

【００３１】

【発明の効果】以上詳細に説明したように本発明によれば、多層基板を構成する導電体層間絶縁体層をガラス繊維を含まないシート状の絶縁体樹脂層で形成し、導電体回路層の所定場所上に導電体回路層間の電気的接続用の導電体からなる突起を設けておき、この積層体をプレス治具板を用いてプレスを行うことによる圧力によって絶縁体樹脂層を突起が突き破ったり、あるいは突起を絶縁体に設けた所定位置の穴を通して絶縁体層を通貫させることが容易となり、対向する前記導電体回路層に当接・圧着させようにして接続部を形成しているから、従来の製造方法と比べて、より薄い多層プリント基板を、簡便にかつ品質よく製作できるという効果が得られる。また、従来の多層基板製造の場合のように、ＮＣドリル等によるスルーホール形成のための細密な穴開け工程が不要となり、その上、接続部を小さな突起で構成するから、ドリルの径よりも小面積による接続が可能となった。これにより、上述の効果と相俟って、基板回路のより微細化を達成するのに対する寄与は大である。

【図面の簡単な説明】

【図１】本発明の第１の実施例を示す基板構成説明図であり、左側図（ａ）はプレス成形前の状態、右側図（ｂ）はプレス成形後の状態を示すものである。

【図２】本発明の第２の実施例を示す基板構成説明図であり、左側図（ａ）はプレス成形前の状態、右側図（ｂ）はプレス成形後の状態を示すものである。

【図３】本発明の第１の実施例の接続部形成の別の態様を示す説明図である。

【図４】本発明の第１の実施例における突起先端部の態様を示す説明図である。

【図５】本発明の第１の実施例における突起先端部の他の態様を示す説明図である。

【図６】図５の半田付着部分の一形成方法を示す説明図である。

【図７】図５の半田付着部分の他の形成方法を示す説明図である。

【図８】図５の突起によるプレス成形時の様子を示す説明図である。

【図９】本発明の第３の実施例を示す接続部の突起先端部の説明図である。

【図１０】図９の対向する突起の鉤型先端部を示す斜視図である。

【図１１】図１０の先端部の接続状態を示す説明図である。

【図１２】図１０の突起の鉤型先端部の一形成方法を示す断面説明図である。

【図１３】二量化レジストによる鉤型先端部の他の形成

方法の原理を示す説明図である。

【図１４】二量化レジストによる鉤型先端部の別の形成方法の原理を示す説明図である。

【符号の説明】

１１０，２１０　下側ステンレス台
１１１，２１１　第１導電体層
１１２　第１、第２導電体層間接続用突起
１２０，２２０　第１、第２導電体層間絶縁体層
１２１，２２１　第２導電体層
１２２　第２、第３導電体層間接続用突起
２２２　第１、第２導電体層間接続用突起
１３０，２３０　第２、第３導電体層間絶縁体層
１３１，２３１　第３導電体層
１３２，２３２　第３、第４導電体層間接続用突起
１４０，２４０　第３、第４導電体層間絶縁体層
１４１，２４１　第４導電体層
１５０，２５０　上側ステンレス台
１６０　固化した樹脂層
２６０　溶融後固化した樹脂部分
３１１　下部導電体回路パターン
３１２　接続用突起
３１３　穴
３２０　絶縁体層樹脂シート
４０１　導電体回路パターン
４０２　接続部用突起
４０３　金（又は白金）
５０１，６０１，７０１　導電体回路パターン
５０２，６０２，７０３　接続部用突起
５０３　半田付着部分
６０３　半田槽
７０２　めっきレジスト
６０４，７０４，８０３　半田付着部分
８００　下部絶縁体層
８０１　下部回路パターン
８０２　接続部突起
８０４　溶融した半田部分
８１０　絶縁体用樹脂シート
８１１　溶融後固化した樹脂部分
８２０　上部絶縁体層
８２１　上部回路パターン
９０１　下部絶縁体層
９０２　下部導電体層
９０３　下部側接続部突起
９０４　上部側接続部突起
９０５　上部導電体層
９０６　上部絶縁体層
１００１　下部側接続部突起
１００２　上部側接続部突起
１１０１　下部側接続部突起
１１０２　上部側接続部突起

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１１０３，１１０４　接続面
１１０５，１１０６　すべり面
１２０１，１２０４　めっきレジスト
１２０２　導電体層
１２０３　接続用突起
１３０１　下地
１３０２　下部しぼみ部分
１３０３　レジストえぐり部分

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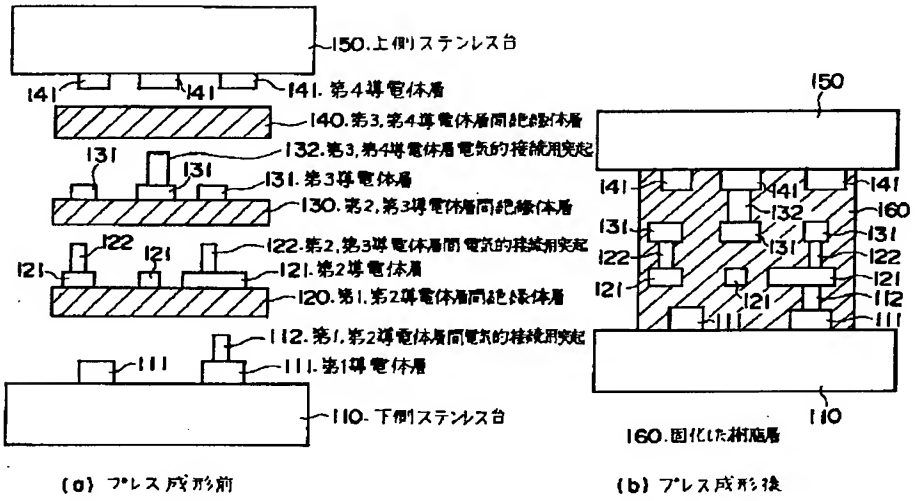
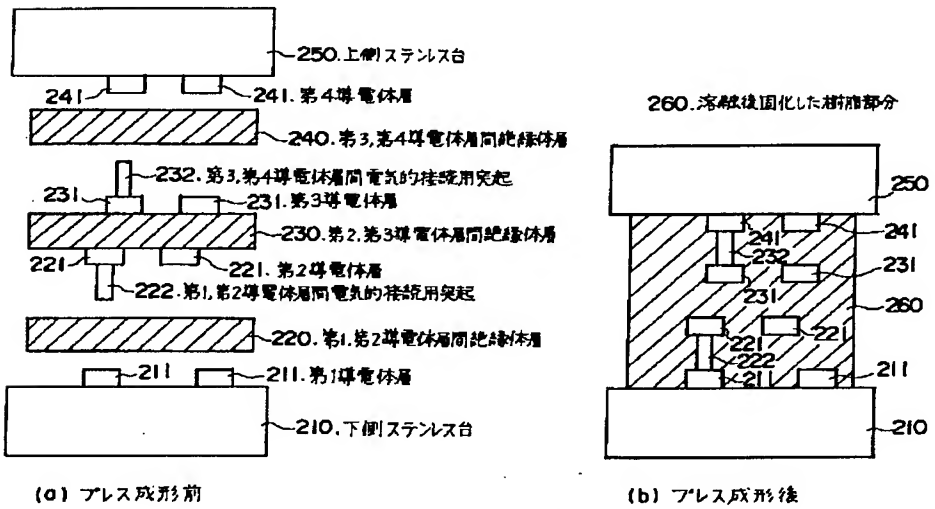
１３０４　レジスト硬化部分
１３０５　レジスト未硬化部分
１４０１　突起形成用レジスト
１４０２　導電体層
１４０３　突起
１４０４　処理膜
１４０５　滑り・噛み合い面形成用レジスト

【図１】



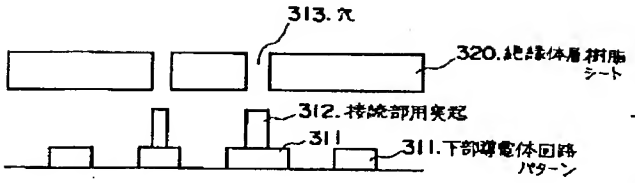
本発明の第１の実施例を示す基板構成説明図

【図２】



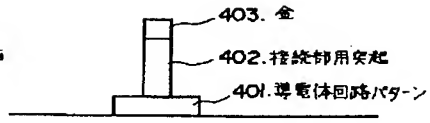
本発明の第２の実施例を示す基板構成説明図

【図３】



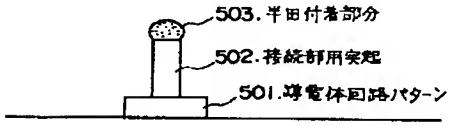
本発明の第１の実施例の接続部形成の態様例

【図４】



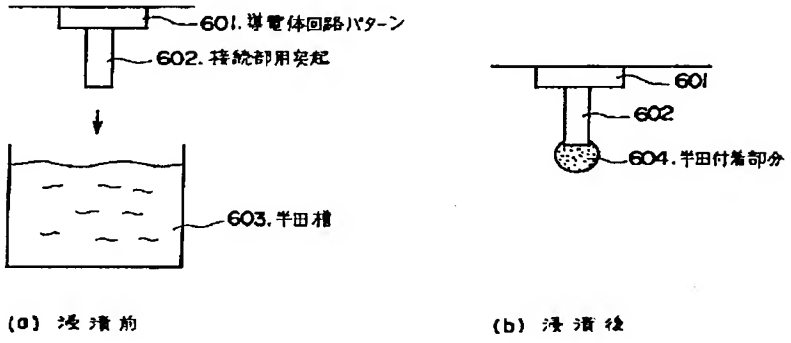
第１の実施例の突起先端部の態様例

【図５】



第１の実施例の突起先端部の他の態様例

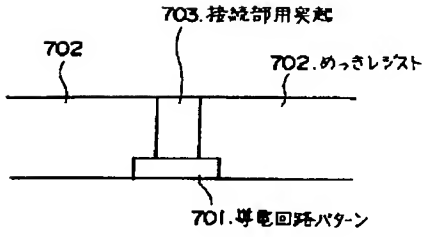
【図６】



(a) 浸漬前　　(b) 浸漬後

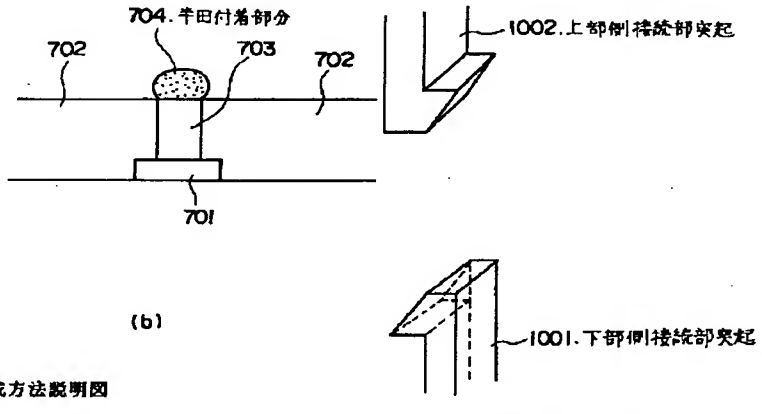
図５の半田付着部分の一形成方法説明図

【図７】



(a)

【図１０】



(b)

図５の半田付着部分の他の形成方法説明図

図９の先端部の鉤形突起

【図８】

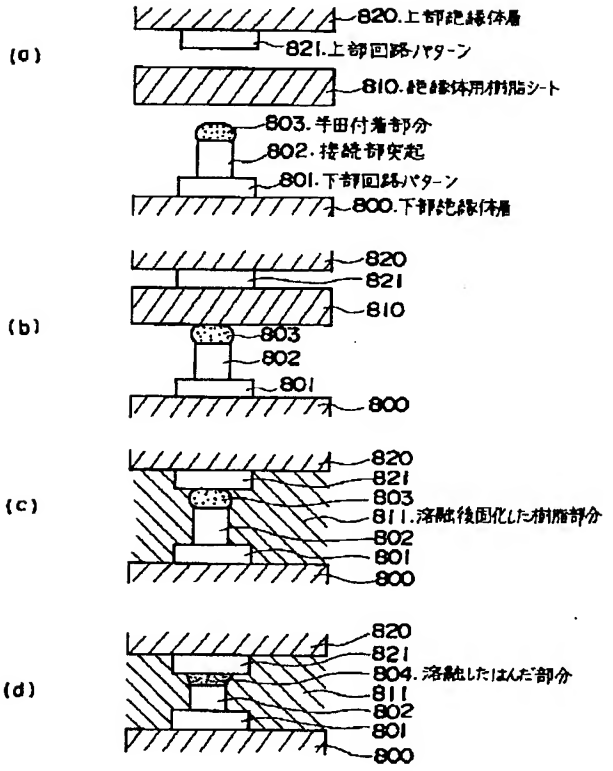
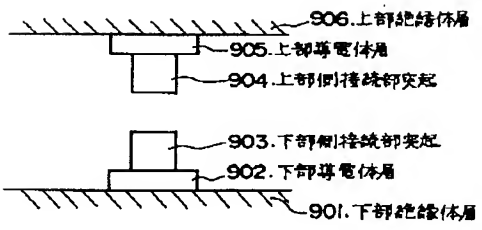


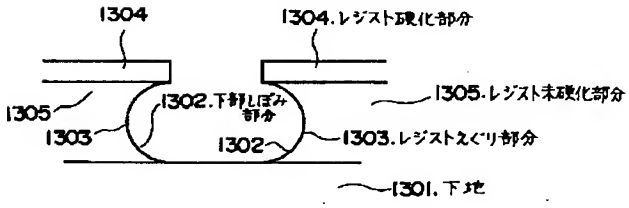
図５の突起によるプレス成形説明図

【図９】



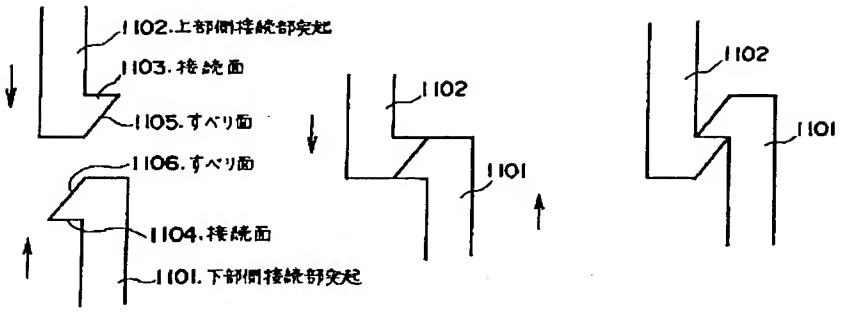
本発明の第３の実施例を示す突起先端部

【図１３】



本発明の二量化レジストによる鉤形先端部の一形成方法

【図１１】



(a) プレス前　(b) プレス中　(c) プレス後

図１０の先端部の接続状態説明図

【図１２】

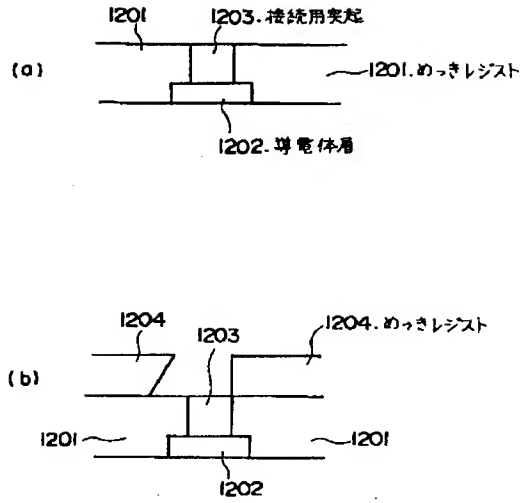
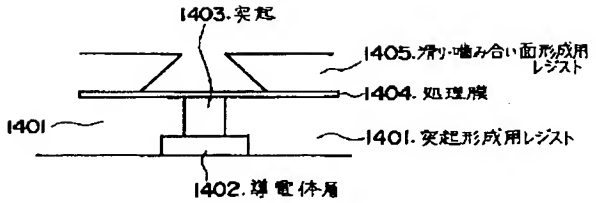


図１０の先端部の一形成方法説明図

【図１４】



二量化レジストによる鉤形先端部の別の形成方法

フロントページの続き

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